ABSTRACT OF THE DISCLOSURE

High-purity hydrogen is recovered from a pyrolysis gas, composed mainly of hydrogen and carbon monoxide, produced by pyrolysis of an organic material such as biomass. A method for producing such high-purity hydrogen includes supplying a reducing gas produced by pyrolysis of an organic material to an anode side of a high-temperature steam electrolyzer having a diaphragm comprising solid oxide electrolyte; and supplying steam to a cathode side of the high-temperature steam electrolyzer to produce hydrogen and oxygen by electrolytic action. The oxygen produced in the cathode side of the high-temperature electrolyzer passes through the diaphragm and reacts with the reducing gas to create concentration gradient of oxygen ion, thus lowering electrolysis voltage.